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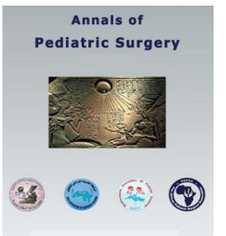

Original Article

Evaluation of the Success Rate and Complications of Laparoscopic Versus Microsurgical Subinguinal Varicocelectomy in Adolescent Varicoceles

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ABSTRACT

Background: Varicocele is characterized by abnormal dilatation of the pampiniform plexus veins and is seen in 14-20% of adolescent males. Treatment options are laparoscopic Palomo varicocele ligation (LPV) and microsurgical subinguinal varicocelectomy (MV). It is aimed to evaluate the results of patients who underwent surgical treatment for adolescent varicocele.

Methods: The data of patients operated on for varicocele between 2012-2021 were analyzed retrospectively. The patients were grouped as LPV and MV according to the surgical method applied and evaluated in terms of treatment and follow-up results.

Results: Forty-three patients aged 14.6±1.8 years were operated on for left-sided varicocele. LPV was applied to 29 (67.4%) and MV to 14 (32.6%). Operation duration was 54.4±15.3 minutes in LPV and 98.9±36.8 minutes in MV ($p<0.0001$). No intraoperative complications were seen. The mean follow-up duration was two years (6 months-5 years). In 62.5% of the patients with preoperative testicular atrophy, the operated testicle caught the size of the right testicle in 12 months. Testicular atrophy was not seen in any patients. Scrotal pain regressed in all. Four patients (9.3%) developed complications. Hydrocele was seen in one patient after MV and two patients after LPV. Recurrence was detected in one patient. The two groups had no statistical difference regarding complications (p=1,000).

Conclusion: With surgical treatment of adolescent varicoceles, it is possible to eliminate the symptoms related to varicocele, such as pain, and reverse the atrophy process in the testicle. While operative durations are shorter and easy to apply in LPV, MV has lower complication rates.

Keywords: adolescent , laparoscopic Palomo varicocele ligation (LPV), microsurgical varicocelectomy (MV), varicocele.

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INTRODUCTION

Varicocele is characterized by abnormal dilatation of the pampiniform plexus veins and is seen in 14-20% of adolescent males [1]. Varicocele is one of the most frequent causes of treatable male infertility [1]. There are some indications for surgical repair: unilateral testicular hypotrophy, bilateral palpable or symptomatic varicoceles, and abnormal semen analysis associated with the varicocele [2].

There are many options to treat varicoceles: high inguinal, subinguinal, retroperitoneal open, microscopic or laparoscopic

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ligation of testicular veins, or mass ligation, testicular vein embolization or plication of varicose pampiniform plexus [3-5].

Two of the currently accepted surgical options in the treatment of varicocele are laparoscopic Palomo varicocele ligation (LPV) and microsurgical subinguinal varicocelectomy (MV) [3, 4]. It is aimed to evaluate the results of patients who underwent surgical treatment for adolescent varicocele over nine years.

MATERIAL AND METHODS

The study was performed in adherence to the actual form of the Declaration of Helsinki, and informed consent was obtained from all children and/or their parents. Ethical committee approval was obtained from Dr. Sami Ulus Ethical Committee with the IRB number 2022-01/10 on 27th Jan 2022. Between January 2012 and December 2021, 43 children underwent surgery due to varicocele. The operative technique was laparoscopic Palomo varicocelectomy (LPV) for 29 patients, and subinguinal microsurgical varicocelectomy (MV) was performed for 14. The parents and the patients were informed about the laparoscopic and open repair procedures when the patients were diagnosed with varicocele. The operative technique was determined due to the surgeons' expertise. The method of choice for all laparoscopic procedures was the Palomo varicocelectomy described below. We collected the patient's data retrospectively. All the data were analyzed using IBM SPSS Statistics for Windows (IBM Corp., version 20).

Surgical Technique

Laparoscopic Palomo varicocelectomy: The patients are placed in a supine position under general anesthesia. A 5 mm umbilical trocar is placed, and intraabdominal pressure is set between 10-12 mmCO2 according to the child's weight and age. Laparoscopic exploration is made via a 5 mm telescope with a 30-degree angle. Two 5 mm trocars are placed on the right lower quadrant of the abdomen. Varicose veins of the testicle are explored cranially to the left internal inguinal ring. The peritoneum is opened, and varicose veins and all pedicle structures are dissected and ligated using a vessel-sealing device. The incisions were closed in order by absorbable sutures. Enteral feeding is started on the postoperative 6th hour, and the patients are discharged the following day.

Subinguinal microscopic varicocelectomy: The patients are placed in a supine position under general anesthesia. To expose the pampiniform plexus, a subinguinal oblique incision is made. Utilizing a microscope set to 12- or 16-times magnification, varicose veins, the artery of the spermatic cord, and the testicular artery are carefully identified. The varicose veins are double-ligated with 4/0 vicryl sutures and dissected. In cases where arterial pulsation is not distinguishable due to the traction of the vessels, clamping the vessel from both sides may help identify the flow direction. Then, the fascia and layers were closed in order by absorbable sutures. Enteral feeding is started on the postoperative 3rd hour, and the patients are discharged the following day.

RESULTS

Laparoscopic Palomo varicocelectomy (LPV): 29 patients with varicocele were operated on with an LPV procedure. The mean age at surgical intervention was 14.2±1.9 years (10 – 17 years). All of them were diagnosed as left-sided varicoceles. There was testicular pain in 16 patients and testicular volume loss in 18 patients before the surgery. The average surgery duration was 54.4±15.3 minutes.

The median follow-up was 16 months (6-60 months). All procedures were completed in one session and laparoscopically. No intraoperative complications were seen. Recurrence was seen in one patient in the follow-up period. Postoperative hydrocele was seen in three patients, but postoperative testicular volume loss hasn't occurred.

Subinguinal microscopic varicocelectomy (MV): 14 patients with varicocele were operated on with the MV procedure. The mean age at surgical intervention was 15.3±1.5 years (12 – 17 years). All of them were diagnosed as left-sided varicoceles. There was testicular pain in six patients and testicular volume loss in five patients before the surgery. The average surgery duration was 98.9±36.8 minutes. The median follow-up was 12 months (6-24 months). All procedures were completed in one session. No intraoperative complications were seen. Recurrence wasn't seen in any patients. Postoperative hydrocele was seen in one patient, but postoperative testicular volume loss hasn't occurred.

Testicular volume is calculated using the empirical formula of Lambert in our study. To estimate the testicular volume, there are three standard formulas: the formula for an ellipsoid, length x width x height x 0.52; the empirical formula of Lambert, length x width x height x 0.71; and the formula for a prolate spheroid, length x width x width x 0.52 [6].

The comparative results of the two techniques are shown in Table 1.

Table 1. Comparison of two techniques by results.

	LPV (n=29)	MV (n=14)	*p*
Operation duration (mins)	54.4±15.3	98.9±36.8	<0.001
Postoperative hydrocele	3 (10%)	1 (7.1%)	1.000
Recurrence	1 (3.4%)	0	0.995
Postoperative testicular volume loss	0	0	-
Follow-up (months)	16	12	-

DISCUSSION

Varicocele is seen in approximately 14-20% of adolescent males and is considered an etiological factor for infertility in adult males [1]. And is the most frequent cause of treatable

male infertility [7, 8]. The primary goals of treating varicoceles are preventing the testicle from testicular volume loss and interfering before parenchymal damage [9, 10]. And it is the leading cause of early intervention for varicoceles. It is important to note that varicocele is linked to damaged DNA, which can affect sperm production. Early treatment is recommended [11]. Semen analysis is performed to assess the effects on testicular function, but for ethical reasons, this assessment cannot be performed in adolescents [12].

Subinguinal microscopic varicocelectomy (MV) and laparoscopic Palomo varicocelectomy (LPV) are both widely accepted procedures to treat adolescent varicoceles [2, 13]. Also, varicocele embolization is an alternative technique to surgical ligation and is gaining popularity day by day [14, 15]. Due to our center's limited experience in interventional radiology, we have yet to offer embolization therapy. However, by expanding our capabilities to include this highly effective treatment option, we can provide patients with a broader range of options and increase the success rates of our procedures. There has yet to be a consensus on the best surgical approach for treating adolescent varicoceles. However, preserving the arteries and lymphatics while ligating all varicose veins is crucial in varicocele surgery. A laparoscope with magnifications of 3-4 times can be used, while a microscope with 12-16 times magnification can also be used. Open-microscopic techniques are preferred as they make identifying and preserving the testicular artery more accessible. In contrast, preserving the artery in laparoscopic procedures is more challenging, and the blood flow to the testicle is provided through the spermatic cord's artery.

Recurrence is reported as 0-9.7% for LPV and 0-5.8% for MV [2, 5, 7, 8, 13, 16-19]. Barroso et al. concluded approximately 3-4% recurrences in a study that compared laparoscopic and open Palomo techniques in 1840 patients [20]. In this study, there was one recurrence (3.4%) seen in LPV group. No recurrences occurred in MV group.

Complications are reported 0-18% for LPV and 1.7-8.8% for MV [2, 5, 7, 8, 13, 16-19]. The most frequent complication is postoperative hydrocele [2, 5, 7, 8, 13, 16-19]. Our series shows hydroceles in 10% of patients in the LPV group and 7.1% in the MV group. This result is consistent with the English literature. Post-operative hydrocele occurrence is more likely in LPV, as preserving the lymphatics is more challenging. However, in MV with experience, we believe the post-operative hydrocele count would decrease.

Postoperative testicular volume loss is rarely reported after the varicocelectomy procedures [19]. In our 43 patients, we also haven't seen any in both procedures.

Operation duration of unilateral varicocele is reported between 17-60 minutes for LPV and 40.2-45 minutes for MV in the literature [2, 5, 7, 8, 13, 16-19]. In this study, we have longer durations as 54.4±15.3 minutes for LPV and 98.9±36.8 minutes for MV. The duration of the operation was significantly longer in our series when using a microscope during surgery due to its unfamiliarity in our operating room, and these were the initial cases in the clinic. However, we believe operation durations will be reduced over time in the following cases.

To minimize infertility caused by varicocele, it is essential to follow up after diagnosis closely. Patients should consult the outpatient clinic once every three months to prevent permanent testicular damage and avoid unnecessary surgical approaches. Physical examination and comparative evaluation of both testicles - utilizing size, volume, and presence of venous reflux with Doppler ultrasonography - is necessary. Surgical intervention can minimize the possibility of permanent testicular parenchymal damage.

Testicular pain is an indication of surgery in the literature. Pain indicated surgery in some cases of this study, as in the literature. However, pain is subjective and could be less reliable in adolescents than in adults.

The study has some limitations, such as evaluating a small group of patients, a relatively short follow-up period, and lack of experience of the surgery team and operating room staff in microscope usage during earlier cases. As experience was gained, our artery and lymphatic sparing skills improved significantly.

CONCLUSION

With the surgical treatment of adolescent varicoceles, it is possible to eliminate the symptoms related to varicocele, such as pain, and reverse the atrophy process in the testicle. While operation durations are shorter and easy to apply in LPV, MV has comparable complication rates. To determine the better technique or the gold standard for varicocele treatment in adolescence, prospective large series with multicenter studies are needed.

DECLARATIONS

Ethics approval and consent to participate: The institutional ethics committee endorsed the study by means of Minutes No. 71 550-23. Due to the design of the study, no informed consent was required.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIAL

All data generated or analyzed during this study are included in this published article.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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AUTHORS' CONTRIBUTIONS

All authors participated in study conception and protocol elaboration. Data collection was carried out by M.E.R.B. Manuscript drafting was carried out by L.C.G.V. Figure preparation was carried out by A.I.L.L and J.J.V.H. All authors read and approved the final manuscript.

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ABBREVIATIONS

(PSF): Pyriform sinus fistula, **(TCA):** Trichloroacetic acid, **(CT):** Computed tomography, **(MR):** Magnetic resonance, **(POCUS):** Point of care ultrasound.

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